

INDUSTRIAL PERSONAL COMPUTER FOR CLASS "C" INDUSTRIAL ENVIRONMENT

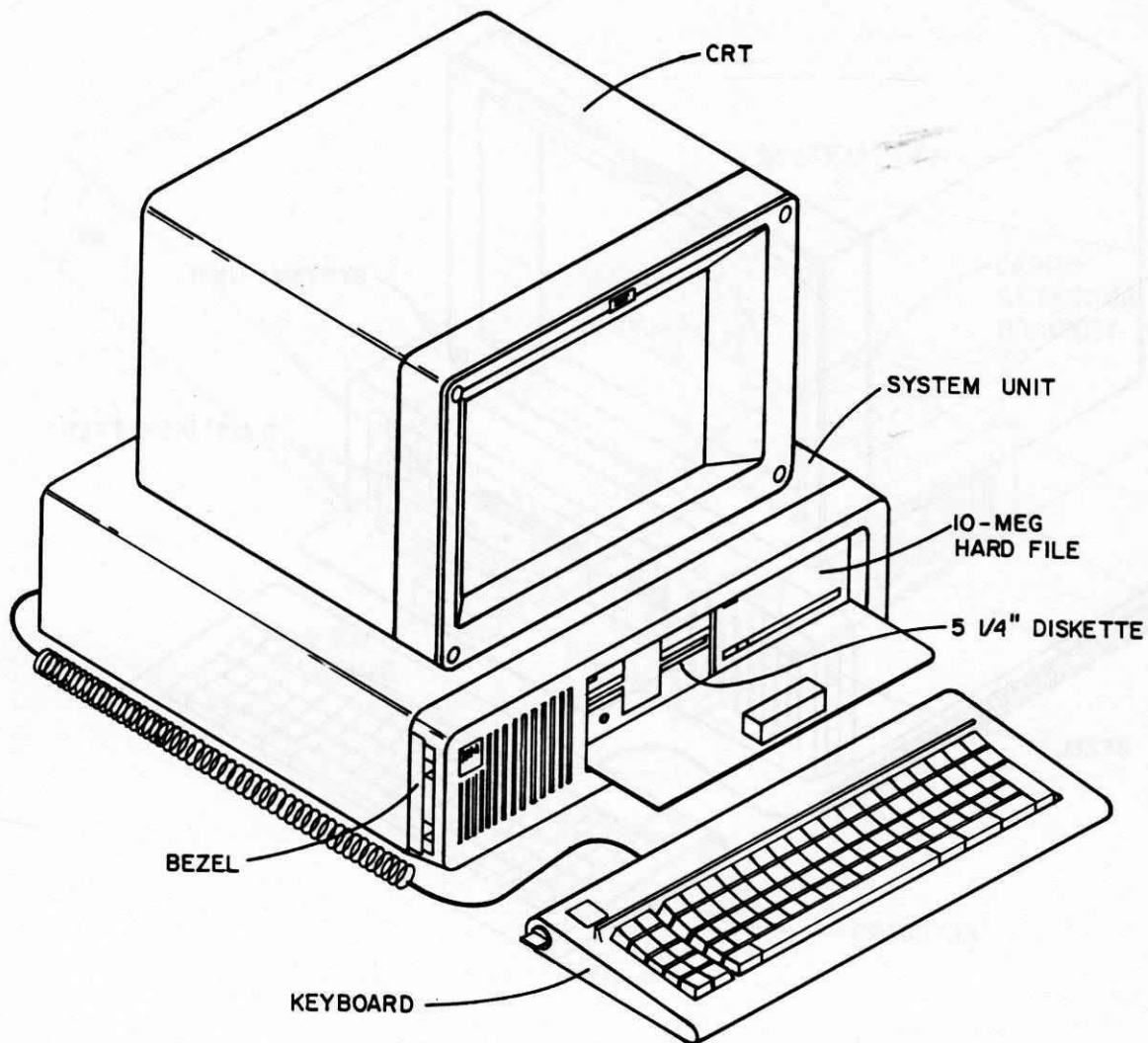


FIG. 1

This article describes a personal computer which is ruggedized for use on a plant floor. A fan is used to obtain positive pressurization to reduce particulate contamination. A cable retainer prevents power

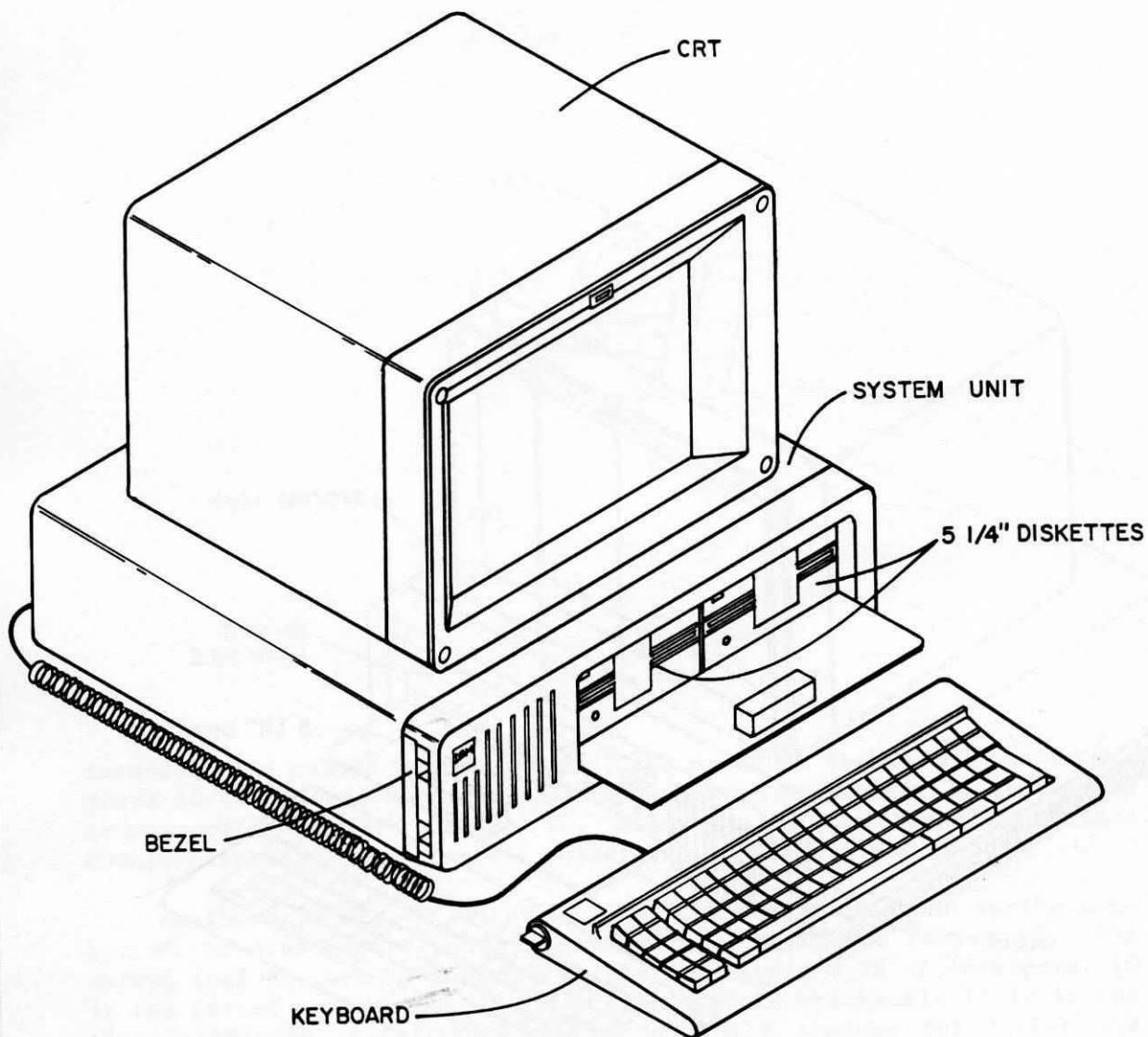


FIG. 2

cables and the keyboard cable from being accidentally removed. A retaining bracket is used to maintain the logic cards in position in the computer.

The present disclosure sets forth several modifications to the IBM Personal Computer XT so that it can function in a class "C" industrial

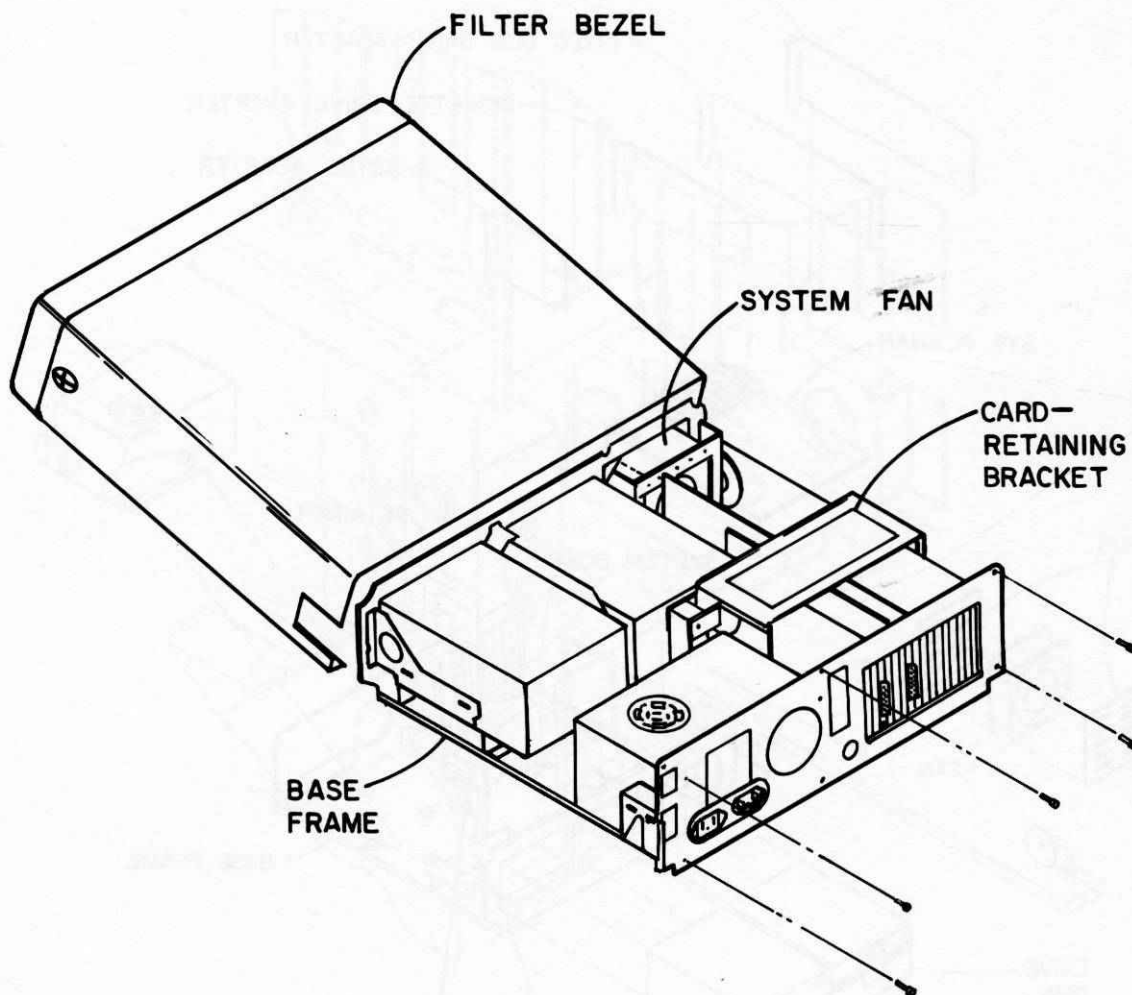


FIG. 3

environment as well as environments with moderate particulate contamination. Figs. 1 and 2 show the two basic configurations of the industrial computer. Fig. 1 shows a system with a single 5 1/4 inch diskette and a 10-megabyte hard file. Fig. 2 shows the second system consisting of two 5 1/4 inch diskettes. At first glance, either machine looks like a standard IBM Personal Computer XT. However, several modifications have been made to the system unit, keyboard, and CRT to make the system adaptable to industrial environments.

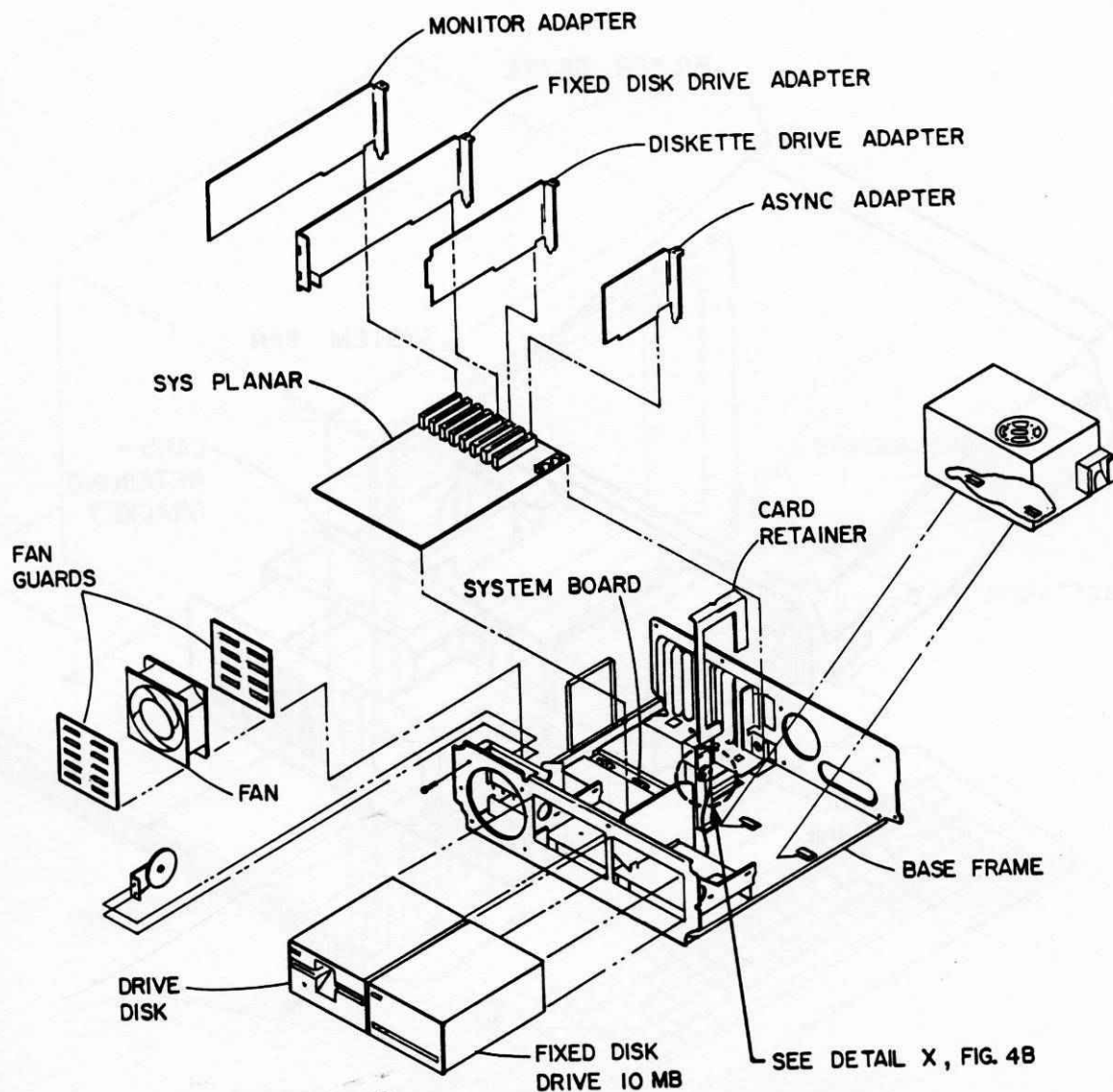
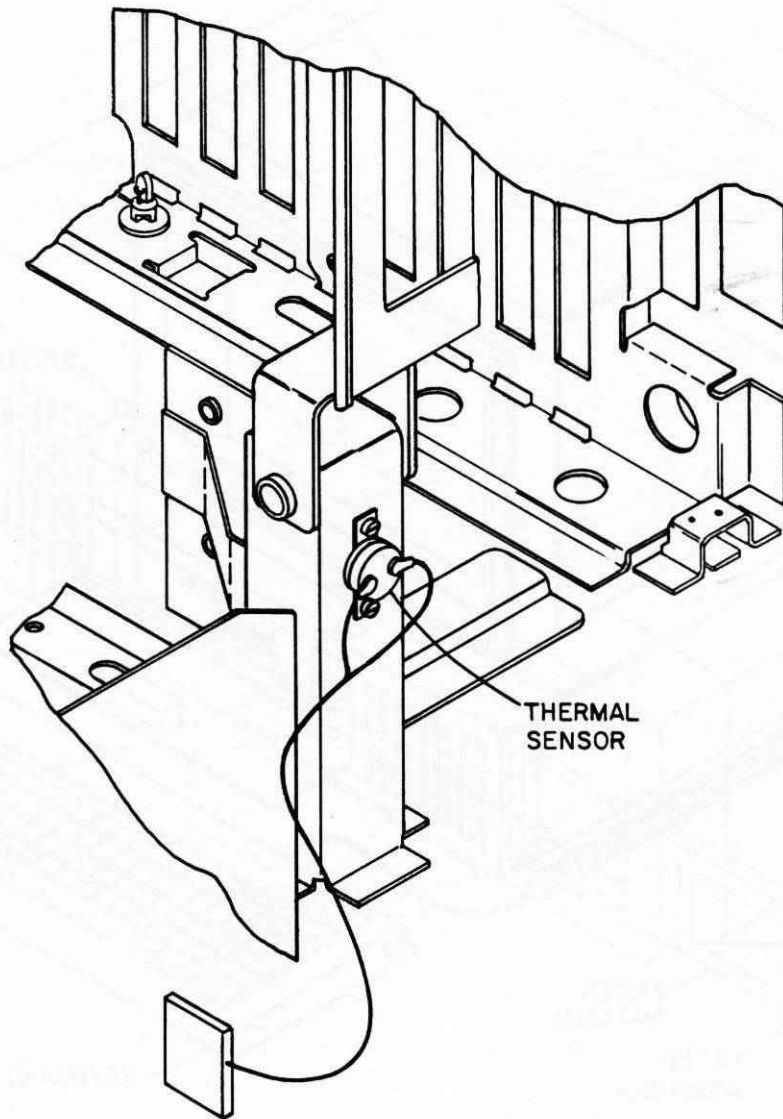


FIG. 4A

The system unit for the industrial computer is similar to the IBM Personal Computer XT. The system unit differs dimensionally by 50 mm (1.97 in.) in depth and 12 mm (0.47 in.) in height. Visually, the bezel on the front of the machine (Fig. 1) is vertical, as opposed to sloped on the XT, with elongated ventilation slots to allow increased air flow. The color the industrial computer will be painted will be an



DETAIL X

FIG. 4B

industrial gray (medium to dark gray) or any suitable factory environment color.

The major modifications made to the IBM Personal Computer XT to transform it into an industrial personal computer are shown in Figs. 3, 4 and 5.

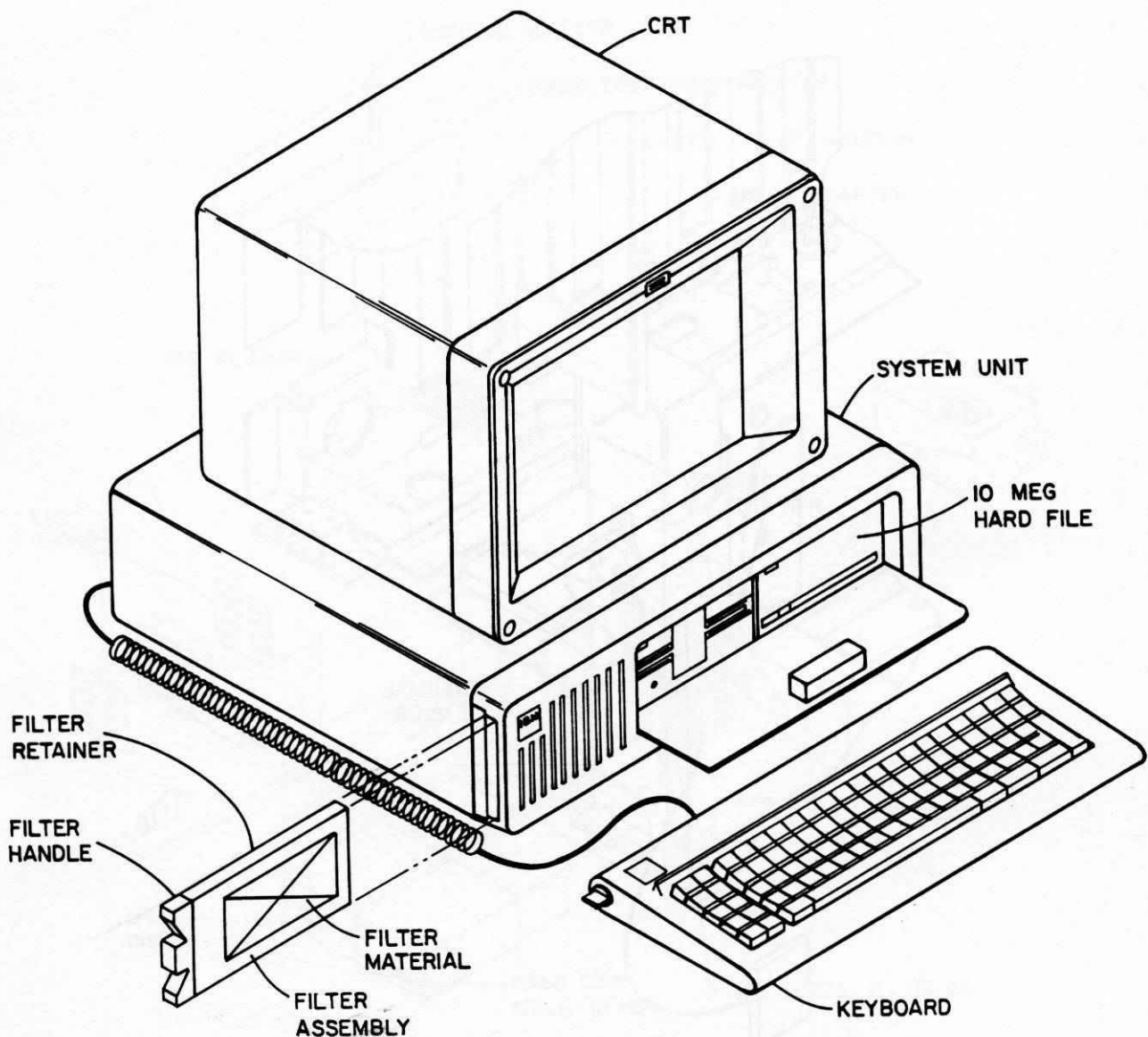


FIG. 5

The first major concern for the industrial computer is that of operation in a high temperature environment. The solution to this problem was to install a fan in the base frame (Figs. 3 and 4). In order to accommodate this fan, the base frame was elongated by 50 mm (1.97 in.). The fan provides two vital functions to the system unit. First, the fan circulates air over the logic cards and throughout the

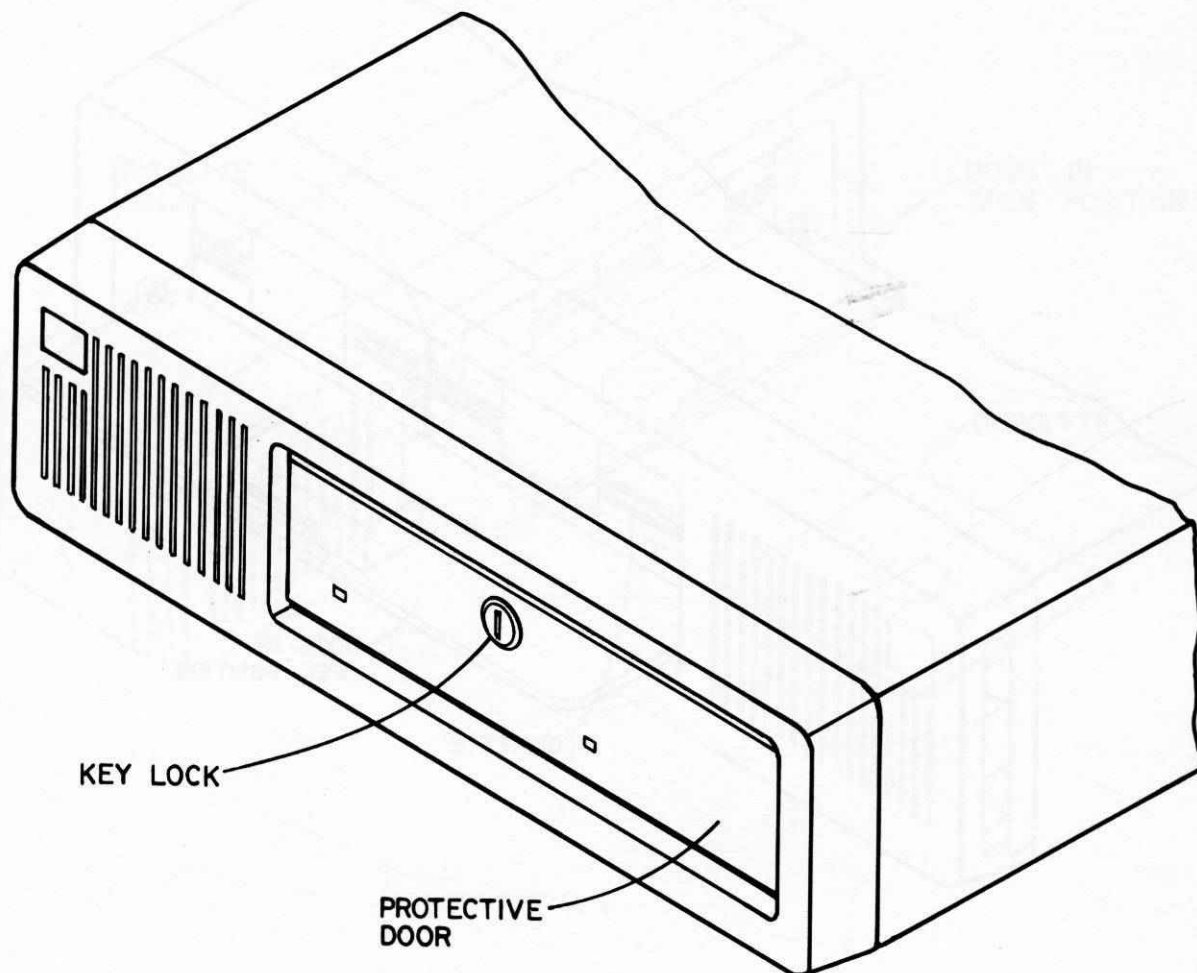


FIG. 6

system unit (see detail in Fig. 9A). This serves to keep the system unit within operational temperatures during exposure to class 'C' environments. The second function of the fan is to provide positive pressure inside the system unit (i.e., continuous air flow out of the system unit) to prevent particulates from entering the computer. The result of this pressurization forces air out through any cracks or seams as well as through the diskette opening.

In order to filter out any particulates which would enter the system unit through the fan, a filtering system was designed into the

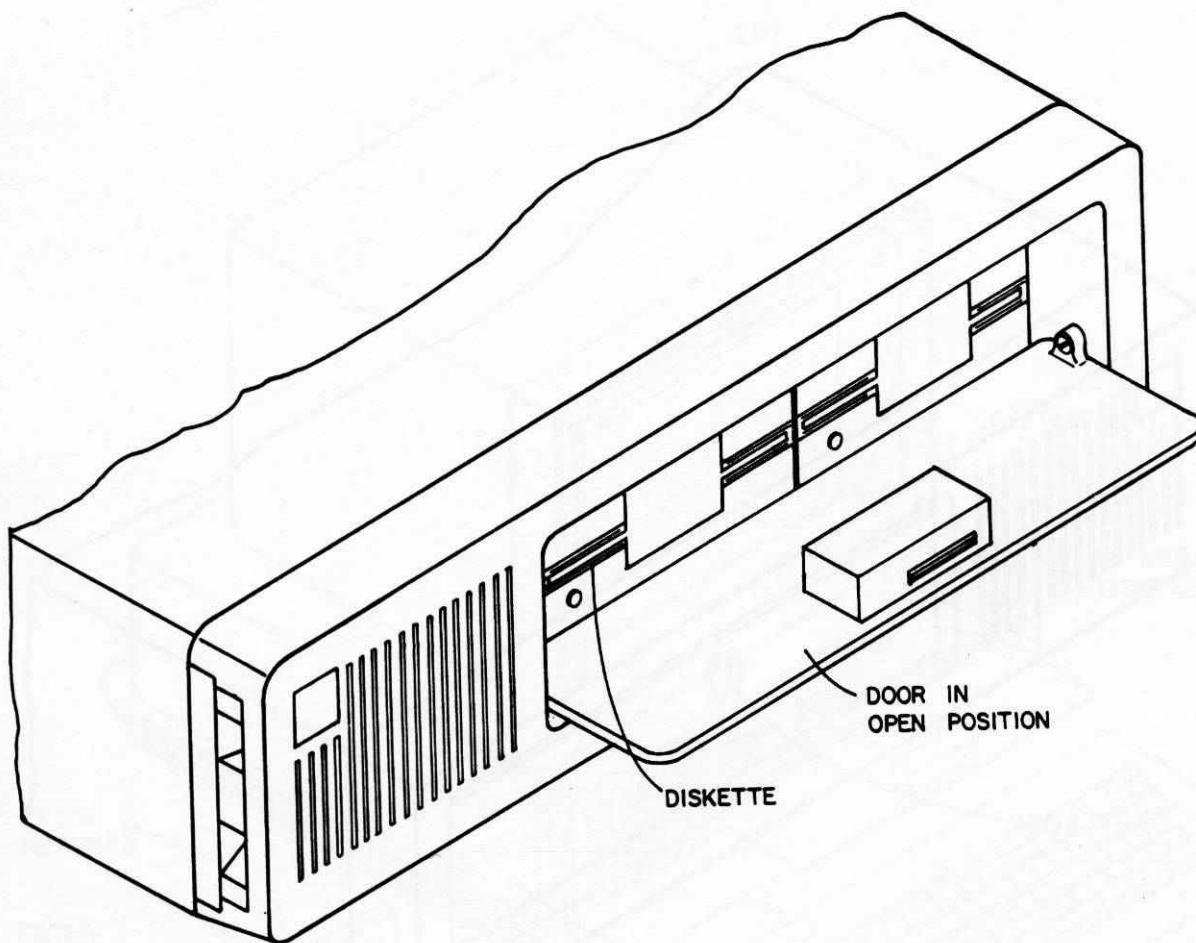


FIG. 7

bezel. Fig. 5 shows the basic component of this filtering system. The filter assembly is designed to 'slide into' and 'lock in place' inside the bezel. Filter replacement is accomplished by sliding the filter assembly out of the bezel, unsnapping the filter retainer from the frame handle and removing the filter. The process is reversed to re-install the filter. In order to protect the system unit from a clogged filter, a high temperature sensor is provided within the unit to inform the user of an overload condition (Figs. 4A and 4B).

In addition to problems of high temperature and particulate contamination, industrial environments expose electronic equipment to repeated or instantaneous vibrational forces. To prevent any of the logic cards from vibrating out of their designated slots, a card-retaining bracket was added to the base frame (see detail in Fig. 9B and

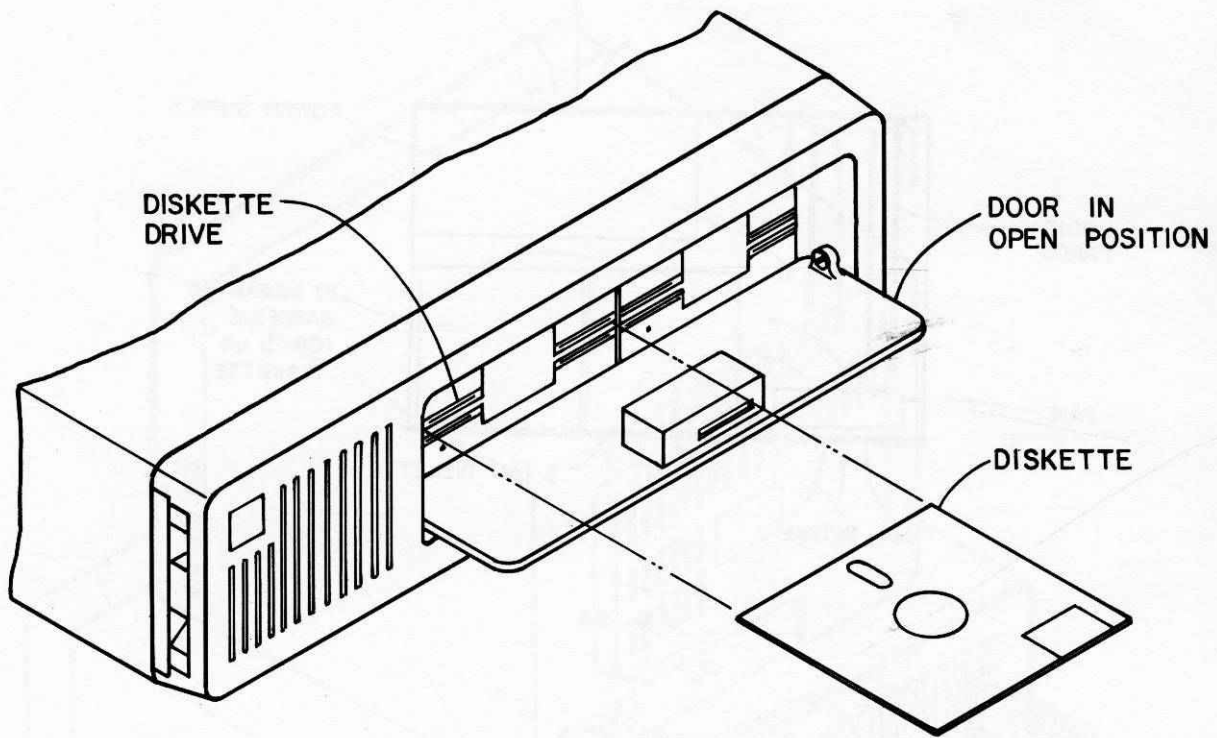


FIG. 8

Figs. 3 and 4). This retaining bracket can be swung out of the way to install or remove cards and is fastened by the use of a single set-screw.

The CRT used in this system is a modified IBM Personal Computer display. The modifications made to the display were the addition of a fan and filter system to allow use in a class "C" environment and the closure of the top vents to prevent contaminants from entering the CRT enclosure. Fig. 9C shows the intended air flow through the modified CRT.

The keyboard used in the industrial personal computer is similar in appearance to the IBM Personal Computer XT keyboard. The major difference in the keyboard is that it is a membrane-type keyboard rather than a capacitance-type key switch. Using the membrane keyboard protects the keyboard and thus the operation of the keyboard from liquid spills and other possible contaminants.

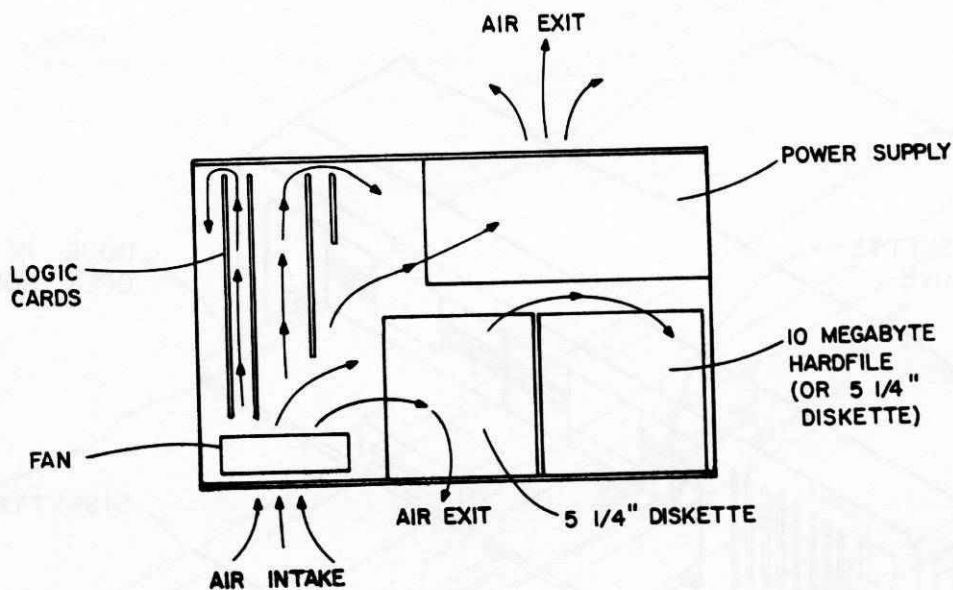


FIG. 9A

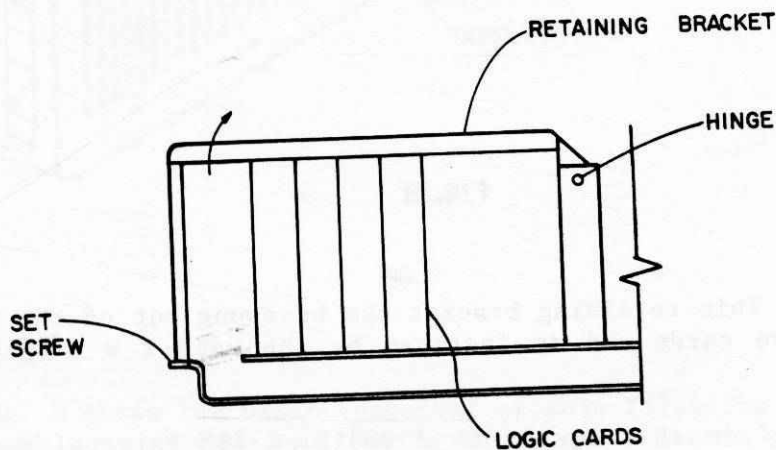


FIG. 9B

A feature which can be used on the industrial computer is a protective door. This door is illustrated in Figs. 6, 7 and 8. The door prevents unwanted removal of any diskette placed in the 5 1/4 inch drive. The door is designed to mount in between the diskettes and lock with a key lock. Diskette removal and installation is shown in Fig. 8.

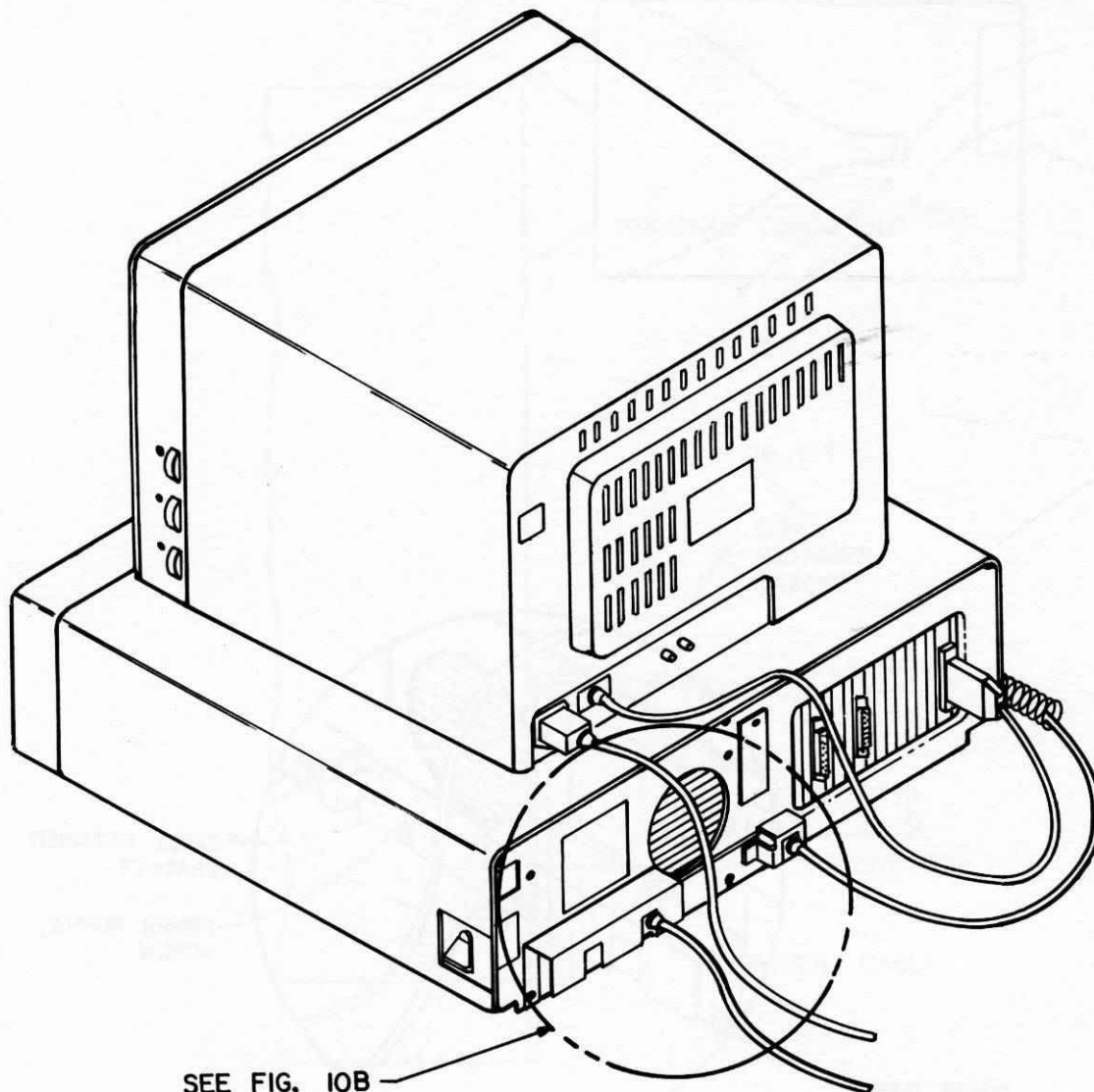


FIG. 10A

In certain applications, it is undesirable for either the power cable or the keyboard cable to be removed from its connector on the personal computer. For example, in the case of the industrial personal computer where the unit must operate on the plant floor, a significant amount of data can be lost if the power cable is accidentally removed from its connector during data input operations. Similarly, no data

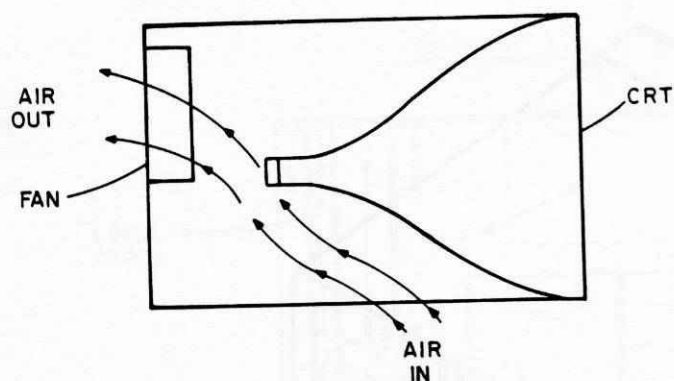


FIG. 9C

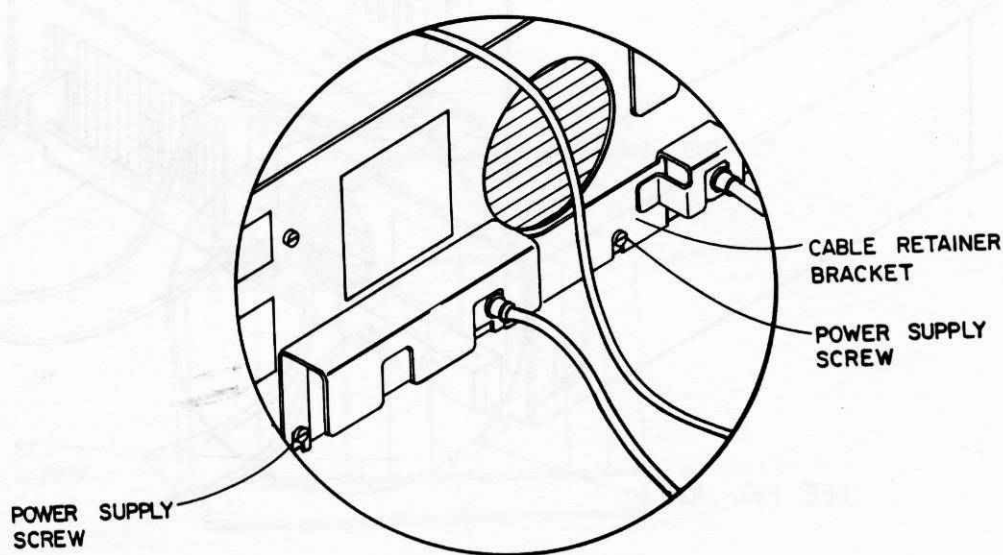


FIG. 10B

can be inputted via the keyboard if its connector is loose or disconnected. In addition to keeping the connectors attached to the computer, a retainer bracket (Fig. 10) provides some degree of security. Since the retainer bracket is screwed on to the rear of the machine, it prevents easy removal of the keyboard, power cable, and, if used, the monochrome monitor.

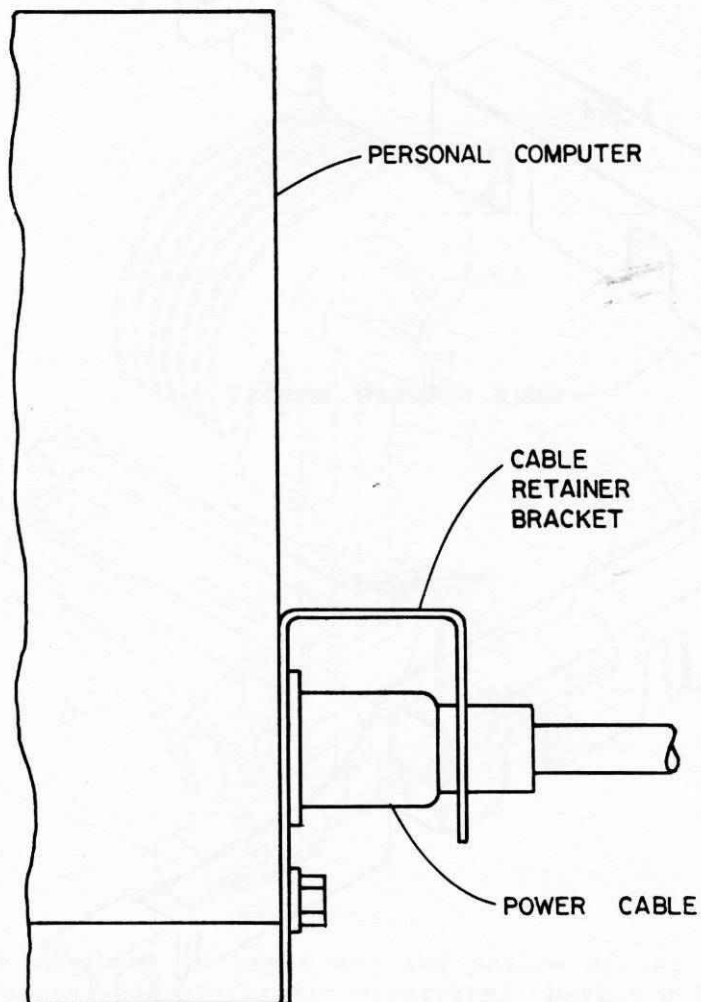


FIG. 11

Installation of this bracket is illustrated in Figs. 10A and 10B. With the power and keyboard cables in place, the two lower screws on the power supply are loosened. The retainer bracket is then slid over the screws, and the screws tightened. Fig. 11 shows the retainer

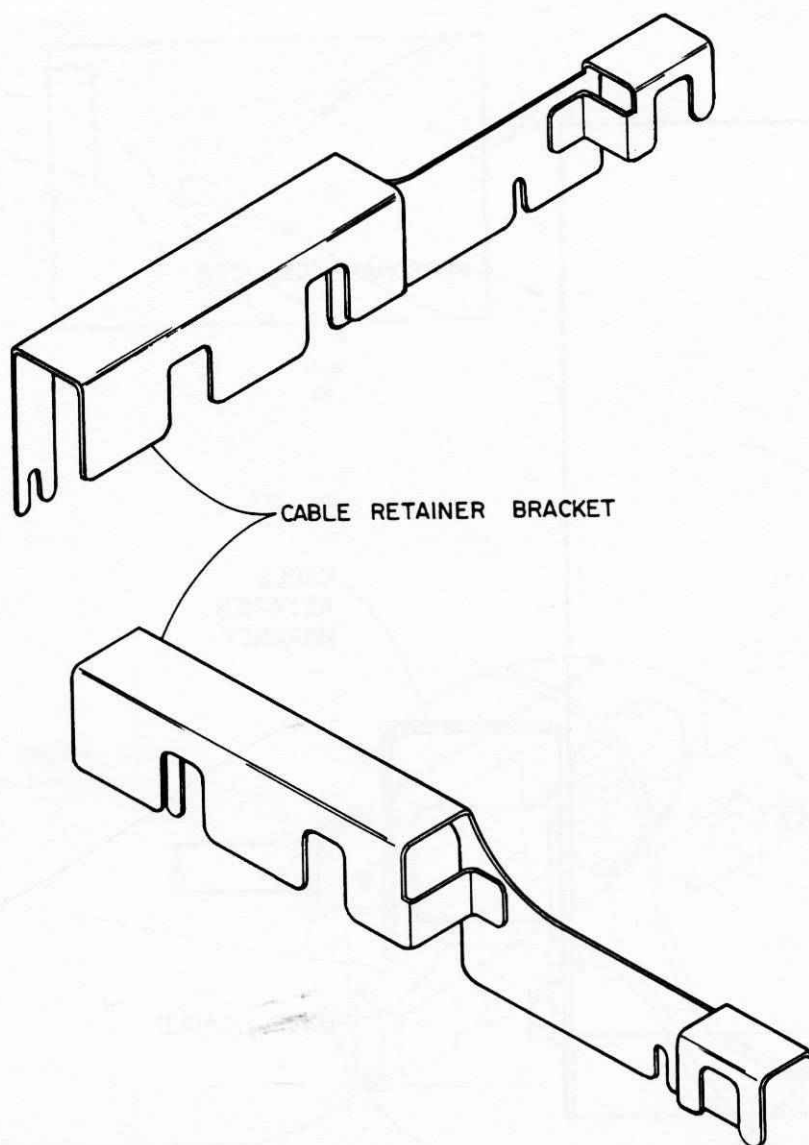


FIG. 12

bracket in its installed position. Fig. 12 shows a detail of the re-
tainer bracket.